Teacher's Background

Fawn camouflaged in grass

Plants and animals have predictable life cycles. Each generation of individuals inherits characteristics, or traits, from its parents. Many of these inherited traits are a direct result of the environment in which an organism lives. The traits that help an organism survive are the ones that get passed on through natural selection and result in physical and behavioral adaptations.

Within any population of a particular species, individuals are not carbon copies of their parents; some traits will vary from their parents and from other individuals. When individuals have variations that help them survive through more reproductive cycles, the traits are passed on to successive generations of a species.

Some inherited traits dictate appearance such as the type of teeth, the shape of ears, and the body size and type of the animal. Another inherited trait is coloration, which allows an animal to **camouflage** itself, to use coloring to blend with its surroundings. Such coloration can change with age. For example,

Ermine in melting snow

deer fawns lose their spots as they mature. Ermine, which have white fur as babies, develop the brown coat and white underbelly of the adult just when the young ermine begin to play outside their burrows and are more likely to survive if they are camouflaged. Coloration can also change with the season, as when an ermine's coat changes to brown in the summer and white in the winter.

Some inherited traits are essential to the survival of the organisms. Carnivores like ermine need sharp teeth to catch and eat their prey. Camouflage coloration helps ermine and mule deer fawns hide from predators. The larger size of a cowbird hatchling's mouth makes it a larger target for **host** parents feeding their young and so helps the cowbird hatchling get plenty to eat. A deer's keen senses and speed help it detect and flee from predators, and an ermine's layer of fat keeps it warm in winter. All these traits help animals survive long enough to reproduce.

When animals reproduce, individuals inherit a pair of **genes**—one from each parent—for each trait. For each trait, the inherited genes may be **dominant** or **recessive**. This introduces the element of chance into inheritance. Offspring with two dominant genes for a trait will exhibit that form of the trait. Offspring with one dominant and one recessive gene will still exhibit the trait dictated by the dominant gene, but may pass on the recessive gene to their offspring. Only when offspring inherit two recessive genes will the recessive form of the trait be exhibited in the offspring. For example, an English cocker spaniel's coat will be either a solid color or patches depending on whether it inherits one or two dominant genes for solid color or two recessive genes for patches. Other examples include the spot pattern variations among mule deer fawn, and human variations, such as eye color, hair color, and height.

Variations among individuals within a population are influenced by the environment. Over time, plant and animal changes that provide a selective advantage, those that help an organism survive to reproductive age will generally be passed on. Variations increase the number of directions in which a species can evolve as its habitat or climate changes. Surviving to reproduce is the mechanism by which environmentally-influenced characteristics are passed to offspring. The traits that work toward a species' survival keep being passed on to successive generations, resulting in a greater proportion of individuals within the population possessing these traits. Variations within populations of animals in California provide a wealth of examples showing how animals adapt to their changing environment. Kangaroo rats that live in the drier, low deserts of southern California are smaller than the same species living in the somewhat wetter high deserts farther to the north.

Adaptation is a long-term process that results in changes to the bodies or behaviors of plants and animals that increase their chances of survival as the environment changes. Evolutionary adaptations take place over generations and occur when a variation that helps a species survive becomes more widespread throughout a population. It is an ongoing process of organisms adjusting to their environment. When humans cause changes to the environment, the plant and animal species living in that environment are affected directly and indirectly. As human populations have grown, changes to and destruction of habitat have become a major force influencing animal populations and the factors that they must adapt to if they are to survive.

The past century of human activity in California has left only about one quarter of the natural habitat in the Sierra Nevada intact. Intensive logging, mining, railroad building, development, fire suppression, and cattle grazing have damaged or

Deer leaping over fence

Replanted pine forest

fragmented forest lands. The intact habitat tends to be at higher elevations, much of it above the tree line, although only about 40 percent of the forest lands that ermine inhabit remain intact. At lower altitudes, sheep and cattle grazing has reduced the mule deer's food supply. The largest blocks of mountain forests still intact are in California's national parks, including Yosemite.

Where forest areas are heavily logged, they are often replanted with genetically similar seedlings of one species. Such "simplified" forests contain less diversity of plant and animal species. Older trees, with their greater structural strength, are gone, leaving the less biologically diverse forest open to tree-killing insects and fungi.

Decreasing grazing by livestock, changing forestry practices, and revising fire management policies and practices are all measures that can help to restore forest habitats.

Woodland habitat along the banks of freshwater streams, rivers, and lakes is also threatened by human activity. This habitat is called **riparian** from *ripa*, the Latin word for a river bank. Past the flood plain and shrubs near riverbanks grow mature deciduous forests similar to the hardwood forests in the northeastern United States. The trees' deep roots tap into the water table to get them through dry California summers; in the winter, they lose their leaves.

These riparian woodlands are vital habitats to California. More species of birds nest in riparian woodlands than in any other plant community. Some 140 species use the state's riparian habitat for breeding, nesting, or as a resting spot on their migration. They feed on the multitude of insects the water supports.

A quarter of California's land mammals also depend on riparian habitat as well. Riparian vegetation filters out fertilizer and animal waste from farms before it seeps into streams and groundwater. Plants on the river banks also cut down on erosion.

Much of the state's riparian woodlands have been disturbed or degraded; less than five percent of the riparian habitat existing when California became a state remains. These woodlands have been replaced by orchards or pasture land, where livestock eats plants and tramples seedlings, giving weeds room to take over stream banks. Building dams and reservoirs has changed stream levels and covered valleys that once held riparian woodlands. In the 1970s and 1980s, as thousands of acres of agricultural land were turned to urban use all over the state, flood control measures further reduced the extent of riparian habitat in California.

The loss of riparian habitat has led to a decline in the population of the least Bell's vireo, a migrating song-

Scientists check the snowpack near Lake Tahoe

bird. This once abundant species was down to 300 pairs in California by 1986, due partly to the loss of riparian habitat and partly to the brown-headed cowbirds that parasitize its nests. Cowbirds thrive in the altered riparian habitat. Cowbirds lay eggs in the nests of other birds such as the least Bell's vireo. The vireos then act as hosts and feed and care for the cowbird hatchlings.

In the 1980s, both California and the United States government listed the least Bell's vireo as endangered. Since then, management measures including nest monitoring programs as well as cowbird trapping and removal have resulted in an increase in the least Bell's vireo population. In 1998 the state counted some 2000 male least Bell's vireos.

Since the 1990s, several California organizations and government agencies have joined forces to save, protect, and restore the state's riparian habitat. Limiting grazing, keeping human and pet disturbance to a minimum during breeding season, replacing nonnative plants with native plants, and letting birds—rather than pesticides—control insects are some other measures that are helping reverse the harmful effects of riparian habitat loss.

Glossary

Adaptation: A change in the body or behavior of a species of living things caused by a change in the environment.

Camouflage: Coloring that makes it possible for an animal to blend with its surroundings, making it hard to see.

Dominant: A gene that causes a trait to appear in offspring.

Gene: The specific section of a chromosome that contains the code that enables one generation to pass on inherited traits to the next generation.

Host: An organism on or in which another organism lives or obtains resources.

Recessive: A gene that produces effects when a dominant gene is not present.

Riparian: Located on the bank of a river or other body of water.

Trait: A characteristic way a living thing looks or acts.

Variation: The range of differences in a trait shared by one group of living things.

Unit Planner

	Lesson	Learning Objective(s)	At a Glance
1	**Adapted to Woodlands** **Preparation Time:** 20 min. **Instructional Time:** 45 min.	■ Identify some of the characteristics that organisms inherit from their parents. ■ Recognize that some of these characteristics are essential to the survival of the organisms.	Students read and discuss ***California Connections: Adapted to Woodlands*** and list inherited traits for three highlighted species. Students view photographs of animals in and out of their usual habitats and discuss how human activity changes habitats and can influence an organism's survival.
2	**Traits for Survival** **Preparation Time:** 15 min. **Instructional Time:** 45 min.	■ Recognize that some of these characteristics are essential to the survival of the organisms.	Students use charted information and photographs to learn about traits that are important to mule deer survival. Class discussions focus on traits of young and adult mule deer; and, students create a Venn diagram that identifies survival traits. They use this information to answer questions about survival traits.
3	**Animals That Blend with Their Background** **Preparation Time:** 25 min. **Instructional Time:** 45 min.	■ Provide examples of inherited characteristics that are influenced by the environment.	Students compare photographs of ermine and mule deer fawns against similar and different-colored backgrounds to learn how different traits may influence an animal's survival depending on its habitat. In groups, students use camouflage techniques to hide collage animals from their classmates in a winter or summer woodland habitat.
4	**Alike but Different** **Preparation Time:** 25 min. **Instructional Time:** 45 min.	■ Recognize that there is variation among individuals within a population.	Using photographs, students analyze differences in a breed of dogs. They participate in a simulation of how traits are inherited and why animals can look different, even with the same parents. They look at variations in eye color and height among themselves.
5	**Habitat Change and Variations within Populations** **Preparation Time:** 15 min. **Instructional Time:** 45 min.	■ Provide examples of the effects of human-caused changes to the environment on the characteristics or variations among individuals within a population. ■ Provide examples of variations among individuals within a population that are caused or influenced by the environment.	Students discuss how humans affect riparian habitats. They view photographs and talk about how host species treat cowbird eggs. They discuss how some birds have inherited a trait that causes them to care for only their own young.

Prerequisite Knowledge

Students should know about:
- animal life cycles, including reproduction; animals produce offspring that are like themselves.
- differences between animal life cycles; deer and ermine babies are born, and birds hatch from eggs.

Students should know about:
- animal life cycles, including reproduction; animals produce offspring that are like themselves.

Students should be able to:
- work with Venn diagrams.

Students should know about:
- animal life cycles, including reproduction; animals produce offspring that are like themselves.
- differences between animal life cycles; deer and ermine babies are born, and birds hatch from eggs.

Students should be able to:
- compare images.

Students should know about:
- animal life cycles, including reproduction; animals produce offspring that are like themselves.

Students should be able to:
- record observations as data.
- recognize fractions of a whole and parts of a group.

Students should know about:
- animal life cycles, including reproduction; animals produce offspring that are like themselves.
- birds hatching from eggs.

Students should have:
- previously worked with bar graphs.

All Materials Needed

Lesson Toolboxes identify lesson-specific needs.

Activity supplies:
- Butcher paper: two pieces larger than 11x17
- Double-sided tape: one roll
- Dried beans: two black beans and two speckled beans per pair of students
- Poster paper: three pieces
- Small paper bag: One per pair of students

A-V equipment:
- Overhead or LCD projector, screen

Class supplies:
- Chart paper (optional), construction paper (white, green, and brown), crayons or colored pencils, glue, markers, pencils, rulers, scissors, masking tape

Textbook Alignment

2.2.c.

Houghton Mifflin: Unit A Ch. 1: 6-7, 18-23, 26-31, 40; Ch. 2: 42-45, 58-68, 76

Macmillan/ McGraw-Hill: N/A

Harcourt: SE/TE 164-177, 196-203, 206-217

FOSS: Insects and Plants: Investigation 1 Part 3 pages 65-70; Investigation 5 Part 3 pages 209-217

2.2.d.

Houghton Mifflin: Unit A Ch. 1: 4-7, 24-31, 38, 40; Ch. 2: 42-43, 66-73, 76; Wrap-Up: 80

Macmillan/McGraw-Hill: Ch. 2: Lesson 3 pages 102-111

Harcourt: SE/TE 170, 174-175, 198-199

FOSS: Insects and Plants: Investigation 1 Part 2 pages 56-64; Investigation 2 Part 3 pages 99-109; Investigation 3 Part 2 pages 126-136; Investigation 4 Part 2 pages 162-166, Part 5 pages 179-184; Investigation 5 Part 2 pages 202-208

English Language Development

Lessons in the EEI Curriculum are designed to support students' English language development. The strategies in these lessons are based on some of the practices identified in the Reading/Language Arts Framework for California Public Schools (California Department of Education 2007) and ideas adapted from the San Joaquin County Office of Education's Regional Technical Assistance Center.

To establish successful instructional strategies for all students, the teacher should:

- **Use a wide variety of ways to explain a concept or assignment.** When appropriate, the concept or assignment may be depicted in graphic or pictorial form, with manipulatives, or with real objects to accompany oral and written instructions.

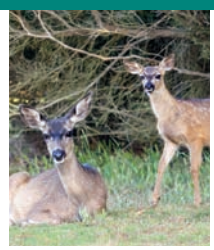
- **Provide assistance in the specific and general vocabulary** prior to the each lesson, using reinforcement and additional practice afterward. Instructional resources and instruction should be monitored for ambiguities and language that could be confusing to students, such as idioms.

- **Ask each student frequently to communicate** his or her understanding of the concept or assignment. Students should be asked to verbalize or write down what they know, thereby providing immediate insight into their thinking and level of understanding. In addition, students should be encouraged to confer about each other's understanding of the concept being taught and the classwork or homework assignments, particularly if the students are not fully proficient in English.

- **Check frequently for understanding in a variety of ways.** When a student does not understand, analyze why.

- **Allow students to demonstrate their understanding and abilities** in a variety of ways while reinforcing modes of communication that are used on standardized tests.

- **Use pacing to differentiate instruction according to students' needs.** Reinforce the more difficult concepts for students experiencing difficulty in the language arts by providing additional time and using the visual aids provided. Accelerate the instructional pace for advanced learners if the assessments indicate mastery of the standard.



The California EEI Curriculum includes a variety of research-based English language development practices, such as:

Vocabulary Development

- Teach difficult vocabulary prior to and during the lesson
- Provide reading, speaking, and assessment tasks that reinforce new vocabulary

Reading Comprehension

- Use grade-level readers, articles, and reading assignments to build comprehension in the content area
- Engage students in meaningful interactions about text
- Provide activities that assess student comprehension and build decoding skills

Writing Strategies and Applications

- Provide opportunities for students to organize ideas and information in a written form including concept maps
- Use stories, articles and other written materials to model good writing
- Provide assessment tasks that allow students to apply their grade-level writing skills

Listening and Speaking Strategies and Applications

- Ask questions to ensure comprehension
- Elicit responses from all students, encourage students to give elaborate responses, and give students time to respond to questions
- Incorporate students' responses, ideas, examples, and experiences into the lesson
- Model and teach language patterns needed to understand and participate in the study of the content areas
- Encourage a high level of response accuracy
- Use visual aids, manipulatives, and real objects to support content delivery

The lessons in this unit can be used to support a variety of English language arts skills. This matrix summarizes how each of the lessons can be used to support English language development.

	V Vocabulary	R Reading	W Writing	L Listening	S Speaking
Lesson 1	✓	✓		✓	✓
Lesson 2	✓	✓	✓	✓	✓
Lesson 3	✓			✓	✓
Lesson 4	✓	✓	✓	✓	✓
Lesson 5	✓	✓		✓	✓

Differentiated Instruction

The 2007 Reading/Language Arts Framework for California Public Schools (California Department of Education 2007) provides guidance for helping students with diverse abilities succeed with California's English–Language Arts Content Standards. The instructional units developed for California's Education and the Environment Initiative provide ample opportunities for teachers to differentiate instruction to meet these needs.

It is important to take into account the State Board of Education's and Department of Education's guidance on differentiated instruction while implementing this instructional unit. Page 263 of the 2007 Framework summarizes this guidance as follows:

The diversity of California's students presents unique opportunities and significant challenges for instruction. Students come to school with a wide variety of skills, abilities, and interests as well as varying proficiency in English and other languages. The wider the variation of the student population in each classroom, the more complex becomes the teacher's role in organizing high-quality curriculum and instruction in the language arts and ensuring that each student has access according to the student's current level of achievement. The ultimate goal of language arts programs in California is to ensure access to high-quality curriculum and instruction for all students in order to meet or exceed the state's English–language arts content standards. To reach that goal, teachers need assistance in assessing and using the results of that assessment for planning programs, differentiating curriculum and instruction, using grouping strategies effectively, and implementing other strategies for meeting the needs of students with reading difficulties, students with disabilities, advanced learners, English learners, and students with combinations of special instructional needs.

Procedures that may be useful in planning for universal access are to:

- *Assess each student's understanding at the start of instruction and continue to do so frequently as instruction advances, using the results of assessment for program placement and planning.*
- *Diagnose the nature and severity of the student's difficulty and modify curriculum and instruction accordingly when students have trouble with the language arts.*
- *Engage in careful organization of resources and instruction and planning to adapt to individual needs. A variety of good teaching strategies that can be used according to the situation should be prepared.*
- *Differentiate when necessary as to depth, complexity, novelty, or pacing and focus on the language arts standards and the key concepts within the standards that students must master to move on to the next grade level.*
- *Employ flexible grouping strategies according to the students' needs and achievement and the instructional tasks presented.*
- *Enlist help from others, such as reading specialists, special education specialists, parents, aides, other teachers, community members, administrators, counselors, and diagnosticians when necessary and explore technology or other instructional devices or instructional materials, such as braille text, as a way to respond to students' individual needs.*

Additional information about best practices in differentiated instruction are detailed in Chapter 7 of the Framework.

Traditional Unit Assessment

Description

Alike and Different (Traditional Unit Assessment Master) assesses students' understanding of inherited traits and variations in a changing habitat. Question 1 demonstrates that students can identify some traits animals inherit. Question 2 assesses recognition of traits essential to survival. Question 3 allows students to provide examples of environment-related inherited traits. Questions 4 and 5 assess whether students recognize variation in a population. Question 6 lets them identify an example of individual variations caused or influenced by the environment. Questions 7 and 8 assess student understanding of how traits and variations are affected by human-caused environmental changes.

Advanced Preparation

Gather and prepare Assessment Master:

- Make one copy per student of **Alike and Different**

Suggested Scoring

Use the Answer Key provided on pages 18–19. There are 8 questions each valued at two points for a total possible score of 16 points.

Preparation Time

5 min.

Assessment Time

15 min.

Safety Notes

None

Alike and Different

Traditional Unit Assessment Master | *page 1 of 2*

Name: _____

Multiple Choice: Find the best answer and circle the letter in front of that answer.

1. Ermine inherit traits such as _____ from their parents.
   a. large feet
   (b.) sharp teeth
   c. white spots

2. _____ is a trait that helps a cowbird hatchling survive.
   a. being fuzzy
   (b.) begging loudly
   c. singing

3. Mule deer fawns have _____ to help them hide.
   a. antlers
   b. long ears
   (c.) white spots

4. English cocker spaniels _____ in color.
   (a.) vary
   b. adapt
   c. change

5. A white ermine would be easy to _____ in summer.
   a. smell
   b. hear
   (c.) see

Answer Key and Sample Answers

Alike and Different

Traditional Unit Assessment Master | *page 2 of 2*

Name: _____

6. Some red-winged blackbirds _____ cowbird eggs.
   (a.) reject
   b. eat
   c. carry

7. If snow melts earlier in winter, an ermine may turn_____.
   a. white earlier
   (b.) brown earlier
   c. white later

8. When humans cut down trees, fawns with white spots may be _____.
   a. harder to see
   (b.) easier to see
   c. easier to smell

Alternative Unit Assessment

Description

Elephant Seals and Pipefish (Alternative Unit Assessment Master) can be used along with, or in place of, the traditional unit assessment to demonstrate students' mastery of the standards. In this assessment, students are given sets of photos of two different animals—elephant seals and pipefish. Students apply what they have learned in this unit to a new habitat, the ocean off California's central coast. Following each set of photos are related questions.

Advanced Preparation

Gather and prepare Alternative Unit Assessment Master.

Suggested Scoring

Use Answer Key provided on pages 22–23 to score **Elephant Seals and Pipefish**. The total possible score is 25 points; with 5 points per question.

Preparation Time

5 min.

Assessment Time

15 min.

Safety Notes

None

Procedures

Step 1

Distribute copies of **Elephant Seals and Pipefish** (Alternative Unit Assessment Master). Have students follow along as you read the questions. Explain that the photos will help them answer the questions. Make sure all students understand what to do before they start working.

Step 2

Have students work independently to complete the assessment. When students are finished, collect the assessment for correction.

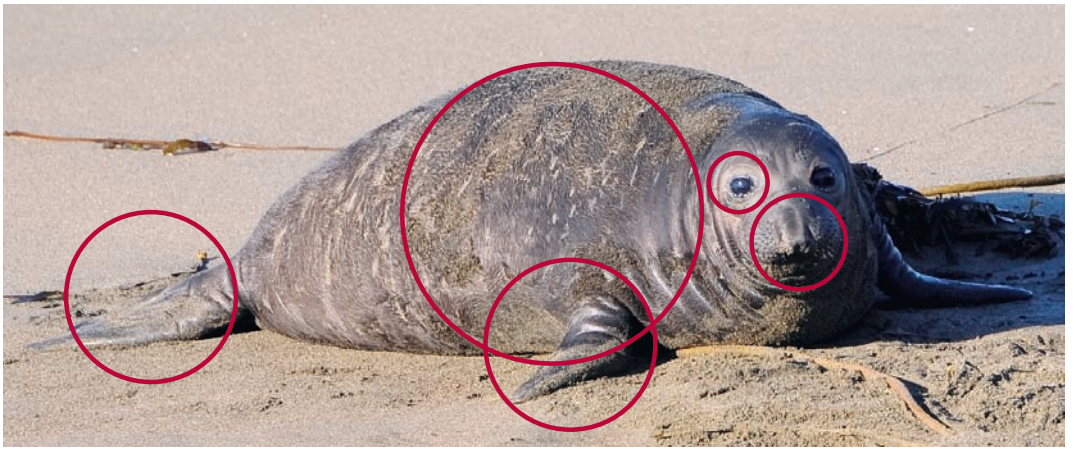
Elephant Seals and Pipefish

Alternative Unit Assessment Master | *page 1 of 2*

Name: _____

1. Look at the pictures below. There is an adult seal. There is a seal pup. Circle four things on the seal pup it inherited from its parents.

Adult elephant seal



Elephant seal pup

The students can correctly circle: the front flippers, the back filppers, the eyes, the large round nose, the heavy body or the gray colored body.

2. Look at the color of the elephant seal pup. The little pups live on the beach. How does their color help them? Underline the answer.

Easy to swim Blend with sand color

Answer Key and Sample Answers

Elephant Seals and Pipefish

Alternative Unit Assessment Master | *page 2 of 2*

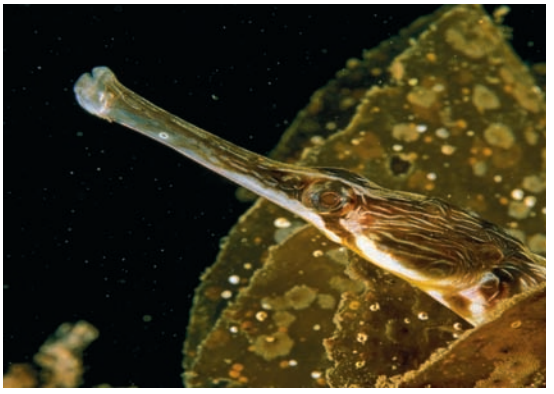
Name: _____

3. Look at the pipefish below. They live in Monterey Bay. They look alike in most ways. In what ways do they look different?

They can be green or brown.

They can be plain or striped.

Pipefish in eelgrass



Pipefish in kelp

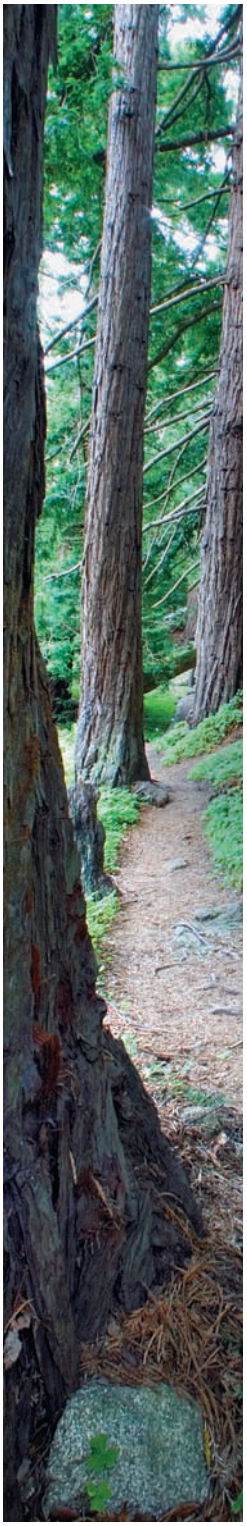
4. What color for pipefish is best in the kelp?

brown

5. What color for pipefish is best in the eelgrass?

green

Extensions & Unit Resources



Extension Ideas

Create a reading shelf in the classroom with books from the list below. Make these books, or others of your choosing, available for free-time reading and book reports. Sharing one or more of the recommended picture books with the class would be time well spent.

Resources for Students

O'Connor, Jane. 2005. *Fancy Nancy.* New York: HarperCollins.

O'Connor, Jane. 2007. *Fancy Nancy and the Posh Puppy.* New York: HarperCollins.

Sams, Carl R., and Jean Stoick. 2004. *Lost in the Woods.* Milford, MI: Carl R. Sams II Photography.

Schwartz, David M. 1997. *In the Forest.* Huntington Beach, CA: Creative Teaching Press.

Schwartz, David M., and Yael Schy. 2007. *Where in the Wild.* Berkeley, CA: Tricycle Press.

Seeger, Laura Vaccaro. 2006. *Black? White! Day? Night!* New York: Roaring Brook Press

Smith, Stephanie. 2007. *Ermine's New Home.* Old Greenwich, CT: Little Soundprints.

Tildes, Phyllis Limbacher. 2004. *Animals in Camouflage.* Cambridge, MA: Charlesbridge Publishing, Inc.

References for Teachers

Answers.com. **http://www.answers.com/topic/protective-coloration**

Blue Planet Biomes. **http://www.blueplanetbiomes.org/ermine.htm**

California Partners in Flight Bird Conservation Plans. **www.prbo.org/cms/docs/edu/rip_handoutfinal.pdf**

Enchanted Learning. **http:www.zoomwhales.com/subjects/mammals/weasel/Ermineprintout.shtml**

English Cocker Spaniel Club of America, Inc. **http://www.ecsca.org/ecsinfo.html**

Hymon, Steve. June 28, 2004. Early snowmelt ignites global warming worries. Los Angeles Times. **http://www.calcoast.org/news/water0040628.html**

NatureWatch. **http://www.enature.com/fieldguides/detail.asp?shapeID=1032&curGroupID=5&lgfromWhere=&curPageNum=4**

Project Wildlife. **http://www.projectwildlife.org/living-deer.htm**

Instructional Support

Agencies, institutions, and organizations throughout California have identified themselves as providing programs and materials that support this unit. Links to these resources are available at **http://www.calepa.ca.gov/Education/EEI/instructional_support.html**